

Appl. No. 10/599,539
Amdt. Dated March 21, 2012
Reply to Final Office Action of October 21, 2011

Attorney Docket No. 374611-000575
Customer No. 73230

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Previously Presented) A group of solar cell elements comprising:
a plurality of solar cell elements and at least three wiring members for electrically interconnecting adjacent solar cell elements, each solar cell element comprising:
a substrate comprising a front surface and a rear surface; and
a front surface electrode on the front surface; and
a rear surface electrode on the rear surface; and
wherein the front surface electrode comprises at least three front surface bus bar electrodes and a plurality of finger electrodes;
wherein at least one of the plurality of finger electrodes is connected to two or more of the at least three front surface bus bar electrodes,
wherein the rear surface electrode comprises at least three rear surface bus bar electrodes,
wherein the at least three wiring members electrically interconnect the at least three front surface bus bar electrodes of a first adjacent solar cell element to the at least three rear surface bus bar electrodes of a second adjacent solar cell element, and
wherein each of the at least three front surface bus bar electrodes has a width of not less than 0.5 mm and not more than 2 mm, and each of the finger electrodes has a width of not less than 0.05 mm and not more than 0.1 mm.

2. (Previously Presented) The group of solar cell elements according to claim 1, wherein the substrate of at least one of the solar cell elements has a rectangular shape whose one side is not less than 100 mm and not more than 350 mm in length, and another side is not less than 100 mm and not more than 350 mm in length.

3. (Previously Presented) The group of solar cell elements according to claim 1, wherein each finger electrode has a width of not less than 0.06 mm and not more than 0.09 mm.

4. (Canceled)

5. (Previously Presented) The group of solar cell elements according to claim 1, wherein the substrate of at least one of the solar cell elements comprises on the front surface thereof an opposite conductivity-type diffusion layer having a sheet resistance of not less than $60\Omega/\square$ and not more than $300\Omega/\square$.

6. (Previously Presented) The group of solar cell elements according to claim 1, wherein the substrate of at least one of the solar cell elements includes on the light receiving surface side thereof fine irregularities having widths and heights of 2 μm or less and an aspect ratio of 0.1-2.

7. (Canceled)

8. (Previously Presented) The group of solar cell elements to claim 1, wherein the substrate of at least one of the solar cell elements comprises a semiconductor region in a side of the front surface thereof, the plurality of finger

electrodes corresponding to the substrate are located on the front surface with the semiconductor region interposed therebetween, and an edge line of a contact surface, contacting any one of the plurality of finger electrodes with the semiconductor region, comprises a rugged contour in a plane direction of the front surface with a planar view of the substrate.

9. (Previously Presented) The group of solar cell elements according to claim 8, wherein when an area of the contact surface between the finger electrodes and the semiconductor region is represented by S_1 , an average value of distances between the edge lines of the contact surface within each cut surface formed by cutting at a plurality of cut planes that are generally perpendicular to the direction of electric current flowing through the finger electrode is represented by d_1 , and an entire length of the edge lines is represented by L_1 , the solar cell elements each include at least one finger electrode where the values S_1, d_1 , and L_1 satisfy the following relationship:

$$0.5L_1(S_1 \cdot d_1^{-1} + d_1) > 1.2$$

10. (Previously Presented) The group of solar cell elements according to claim 8, wherein the profile of the edge lines of the contact surface includes at least a part where the edge lines are asymmetric with respect to a center line of the finger electrode forming the contact surface that runs in the same direction as the direction of electric current flowing through the finger electrode.

11-12. (Canceled)

13. (Previously Presented) A solar cell module comprising a group of the solar cell elements according to claim 1.

14. (Withdrawn) A solar cell module comprising:

at least two solar cell strings, each solar cell string comprises a plurality of solar cell elements, and adjacent solar cell elements of the plurality of solar cell elements are electrically connected to each other with wiring members respectively;

a connecting member that electrically interconnects adjacent solar cell strings of the at least two of solar cell strings,

wherein the connecting member interconnects the adjacent solar cell strings with each other at a back side of the adjacent solar cell strings.

15-16. (Canceled)

17. (Withdrawn) The solar cell module according to claim 14, wherein the spacing between the plurality of solar cell elements is not less than 70% and not more than 143% of the widths of the wiring members.

18. (Withdrawn) The solar cell module according to claim 14, wherein all the widths of the wiring members viewed from the light receiving surface side are identical.

19. (Withdrawn) The solar cell module according to claim 14, wherein the widths of the wiring members are not less than 0.8 mm and not more than 2.0 mm.

20. (Withdrawn) A photovoltaic power generator comprising: a plurality of the solar cell modules connected to each other, each solar cell module is according to claim 14.

21. (Previously Presented) The group of solar cell elements according to claim 1, wherein each of the at least three front surface electrodes comprises a first front surface bus bar electrode, and the first front surface bus bar electrode is on a center region of the corresponding substrate, when viewed in a planar view of the substrate.

22. (Previously Presented) The group of solar cell elements according to claim 1,

wherein, for each solar cell element, the front surface is opposite the rear surface, the at least three front surface electrodes comprise a first front surface bus bar electrode, a second front surface bus bar electrode and a third front surface bus bar electrode, and

wherein the at least three rear surface bus bar electrodes comprise a first rear surface bus bar electrode, a second rear surface bus bar electrode and a third rear surface bus bar electrodes, and

wherein the first, second and third front surface bus bar electrodes are opposite the first, second and third rear surface bus bar electrodes respectively.

23. (Previously Presented) The group of solar cell elements according to claim 1, wherein all of the plurality of finger electrodes on each solar cell element are directly connected to two or more of the at least three surface bus bar electrodes.

24. (Previously Presented) The group of solar cell elements according to claim 1, wherein each of the at least three front bus bar electrodes is opposite one of the at least three rear bus bar electrodes and wherein, in plan view, one of the front surface bus bar electrodes is on the center of the front surface and one of the rear surface bus bar electrodes is on the center of the rear surface.

25. (Previously Presented) The group of solar cell elements according to claim 24, wherein, in a lengthwise direction of the three front surface bus bar electrodes, one of the at least three wiring members extends from an end of one of the front surface bus bar electrodes of the first adjacent solar cell element to an end of one of the rear surface bus bar electrodes of the second adjacent solar cell element.

26. (Currently Amended) A group of solar cell elements comprising:
a plurality of solar cell elements and at least three wiring members for electrically interconnecting adjacent solar cell elements, each solar cell element comprising:

a substrate comprising a front surface and a rear surface;
a front surface electrode on the front surface; and
a rear surface electrode on the rear surface; and

wherein the front surface electrode comprises at least three front surface bus bar electrodes and a plurality of finger electrodes;

wherein at least one of the plurality of finger electrodes is connected to two or more of the at least three front surface bus bar electrodes,

wherein the rear surface electrode comprises at least three rear surface bus bar electrodes,

wherein at least three wiring members electrically interconnect the at least three front surface bus bar electrodes of a first adjacent solar cell element to the at least three rear surface bus bar electrodes of a second adjacent solar cell element,

wherein each of the at least three front surface bus bar electrodes has a width of not less than 0.5 mm and not more than 2 mm, and each of the finger electrodes has a width of not less than 0.05 mm and not more than 0.1 mm, and

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wherein the at least three front surface bus bar electrodes comprise a first front surface bus bar electrode, a second front surface bus bar electrode and a third front surface bus bar electrode,

wherein the first front surface bus bar electrode is between the second front surface bus bar electrode and the third front surface bus bar electrode and is on the center of the substrate,

wherein, when the front surface is divided equally into a first area, a second area and a third area in a widthwise direction of the three front surface bus bar electrodes, the first area arranged between the second area and the third area and each area having a centerline which bisects the respective areas in a widthwise direction, and

wherein, in the widthwise direction, a distance from the center line of the second front surface bus bar electrode to the first area is smaller than a distance from the a center line of the second area to the first area, and wherein, in the widthwise direction, a distance from a center line of the third front surface bus bar electrode to the first area is smaller than a distance from the center line of the third area to the first area.